

1 CLAIMS

2 Having thus described our invention, what we claim as
3 new and desire to secure by Letters Patent is as
4 follows:

5 1. A method for validating establishment of at least
6 one IP communication tunnel, the method comprising:

7
8 validating that transformations from an originator of a
9 validation process have been established properly; and

10
11 verifying that at least one participant in the tunnel
12 can communicate with the originator of the validation
13 process.

14 2. A method as recited in claim 1, wherein the step of
15 validating comprises:

16 sending an IP packet on the communication tunnel with a
17 predetermined value in a Time-To-Live field;

18 receiving an ICMP message generated by the network in
19 response to the sent IP packet; and

20
21 examining the contents of the ICMP message to validate
22 that the transformations were done properly.

23 3. A method as recited in claim 1, wherein the step of
24 validating comprises:

1 establishing a device level socket at the originator;
2 sending an IP packet on the communication tunnel;
3 receiving a copy of the IP packet from the device level
4 socket after the transformations have been applied; and
5 examining the contents of the copy to validate that the
6 transformations were done properly.

7 4. A method as recited in claim 1, wherein the step of
8 validating comprises:

9 establishing a dummy interface at originator with the
10 address of a participant in the tunnel;
11 sending an IP packet on the communication tunnel to the
12 participant;
13 receiving the IP packet from the dummy interface after
14 the transformations have been applied; and
15 examining the contents of the packet to validate that
16 the transformations were done properly.

17 5. A method as recited in claim 1, wherein the IP
18 communication tunnel uses Generic Routing Encapsulation
19 as the transformation.

20 6. A method as recited in claim 1, with the step of
21 validating includes:

1 configuring a router to filter a subset of packets;

2 generating IP packets with markings on the
3 communication tunnel; and

4 examining the filtered packets to validate that the
5 transformation has been done properly.

6 7. A method as recited in claim 6, used for validation
7 of a partial route transformation.

8 8. A method as recited in claim 1, wherein the IP
9 communication tunnel uses the IP-security protocols
10 established using the Internet Key Exchange.

11 9. A method as recited in claim 1, wherein the IP
12 communication tunnel uses IP compression as the
13 transformation.

14 10. A method as recited in claim 1, wherein the IP
15 communication tunnel uses network address translation
16 as the transformation.

17 11. A method for validating establishment of an IP
18 communication tunnel, the method comprising:

19 validating that transformations from an originator of a
20 validation process have been established properly;

21 requesting that at least one other participant in the
22 tunnel validate that the transformations from that
23 participant have been established properly; and

1
2 verifying that the other participant in the tunnel can
3 communicate with the originator of the validation
4 process.

5 12. An apparatus for validating establishment of IP
6 communication tunnels, comprising:

7 a transformation validator for validating that the
8 transformations from an originator of the validation
9 process has been done properly; and

10 a communication validator for validating that at least
11 one participant in the tunnel can communicate with the
12 originator.

13 13. An apparatus for validating establishment of IP
14 communication tunnels as recited in claim 6, further
15 comprising a remote party transformation validator for
16 validating that at least one participant in the tunnel
17 performs the transformation properly.

18 14. An article of manufacture comprising a computer
19 usable medium having computer readable program code
20 means embodied therein for causing validation of
21 establishment of at least one IP communication tunnel,
22 the computer readable program code means in said
23 article of manufacture comprising computer readable
24 program code means for causing a computer to effect the
25 steps of claim 1.

1 15. A computer program product comprising a computer
2 usable medium having computer readable program code
3 means embodied therein for causing validation of
4 establishment of at least one IP communication tunnel,
5 the computer readable program code means in said
6 computer program product comprising computer readable
7 program code means for causing a computer to effect the
8 steps of claim 1.

9 16. A program storage device readable by machine,
10 tangibly embodying a program of instructions executable
11 by the machine to perform method steps for validating
12 establishment of at least one IP communication tunnel,
13 said method steps comprising the steps of claim 1.

14 17. An article of manufacture comprising a computer
15 usable medium having computer readable program code
16 means embodied therein for causing validation of
17 establishment of at least one IP communication tunnel,
18 the computer readable program code means in said
19 article of manufacture comprising computer readable
20 program code means for causing a computer to effect the
21 steps of claim 11.

22 18. A computer program product comprising a computer
23 usable medium having computer readable program code
24 means embodied therein for causing validation of
25 establishment of at least one IP communication tunnel,
26 the computer readable program code means in said
27 computer program product comprising computer readable
28 program code means for causing a computer to effect the
29 steps of claim 11.

1 19. A program storage device readable by machine,
2 tangibly embodying a program of instructions executable
3 by the machine to perform method steps for validating
4 establishment of at least one IP communication tunnel,
5 said method steps comprising the steps of claim 11.

6 20. A computer program product comprising:

7 a computer usable medium having computer readable
8 program code means embodied therein for causing
9 validation of establishment of at least one IP
10 communication tunnel, the computer readable program
11 code means in said computer program product comprising:

12 computer readable program code means for causing a
13 computer to effect the functionality of a
14 transformation validator for validating that the
15 transformations from an originator of the validation
16 process has been done properly; and

17 computer readable program code means for causing the
18 computer to effect the functionality of a communication
19 validator for validating that at least one participant
20 in the tunnel can communicate with the originator.

21 21. A computer program product recited in claim 20,
22 wherein the computer readable program code means
23 further comprises computer readable program code means
24 for causing the computer to effect the functionality of
25 a remote party transformation validator for validating

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